WHERE CAN I FIND INFORMATION ABOUT D&D TECHNOLOGIES?

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ABSTRACT

The world-wide web (WWW) provides access to a virtual reference library. As with conventional libraries, it is not always easy to find the information that one desires within the WWW. The Dewey Decimal System of Classification was devised in 1876 by Melvil Dewey to help organize and catalogue books. The WWW has many search engines available to help locate documents and information of interest. These search engines though are sometimes cumbersome and often do not provide the level of refinement needed to conduct efficient and targeted searches. Thus, this paper provides information on specific Internet websites that may benefit those interested in information on technologies for use in Deactivation and Decommissioning operations.

INTRODUCTION

Since 1996, the National Energy Technology Laboratory (NETL) Deactivation and Decommissioning Focus Area (DDFA) has focused a major portion of its program on the demonstration and deployment of innovative and improved deactivation and decommissioning (D&D) technologies to address needs across the U.S. Department of Energy (DOE) complex. The main approach used by the DDFA for demonstration and deployment of technologies has been Large-Scale Demonstration and Deployment Projects (LSDDP). Additional technology deployments have been achieved through Accelerated Site Technology Deployment (ASTD) Projects. Central to the DDFA philosophy has been the recognition that many commercial technologies already exist that are improvements over baseline technologies currently used in DOE's deactivation and decommissioning projects. As part of the LSDDP approach, the DDFA has conducted extensive reviews of baseline D&D technologies in use throughout the DOE Complex and commercial technologies that could be demonstrated within LSDDPs to evaluate their performance against competing baseline technologies. Technology Screening Committees (TSC) for the seven LSDDPs in the DDFA's current portfolio have reviewed over 500 technologies and selected more than 80 for demonstration in the LSDDPs.

This paper discusses many sources of D&D technology information that the TSCs and DDFA have reviewed to screen candidate technologies for demonstration and deployment within the LSDDPs. Since many of these sources are Internet websites, this paper will discuss the content of each website, including its strong points. It is not possible to list and describe all relevant sources of D&D technology information in a single paper; therefore, this paper describes sources that are particularly noteworthy. DDFA encourages the reader to explore these websites and include them as favorites on your web browser toolbar.

D&D TECHNOLOGY INFORMATION WEBSITES

Deactivation and Decommissioning Focus Area – http://www.netl.doe.gov/dd

The DDFA homepage has technical information on all D&D technology development, demonstration, and deployment projects in its portfolio. This includes monthly, quarterly, and annual progress reports

covering the full range of active projects. Technology factsheets contain detailed information on D&D technologies developed, demonstrated, or deployed under sponsorship by the DDFA. The DDFA homepage includes a photo library of D&D technologies as well as two new features added in May 2000. The first new feature links the DDFA homepage directly to websites of D&D technology vendors. D&D technology vendors are welcome to submit their websites for inclusion on this link. The second new feature is the availability of the DDFA Response to the site's fiscal year 2000 technical needs. This document provides a technical response to over 200 D&D needs throughout the complex. The DDFA homepage also contains links to the websites for all LSDDPs and many ASTD projects. Typically, the LSDDP websites contain information on all technologies screened for possible demonstration, demonstration factsheets, and Innovative Technology Summary Reports (ITSRs). The LSDDP and ASTD websites are listed in Table I.

Table I. D&D Focus Area LSDDP and ASTD Websites

Large-Scale Demonstration and Deployment Projects	
Chicago Pile 5 Research Reactor D&D	http://www.netl.doe.gov/dd/cp5/
Hanford C-Reactor Interim Safe Storage	http://www.bhi-erc.com/105c/105c.htm
LANL Transuranic Waste Disposition	http://www-emtd.lanl.gov/LSDDP/DDtech.html
INEEL Fuel Pools & Underwater Reactors D&D	http://id.inel.gov/lsddp/
Mound Tritium Facilities LSDDP	http://www.doe-md.gov/lsdd/lsdd.htm
Savannah River 321-M Deactivation	http://www.netl.doe.gov/dd/
Accelerated Site Technology Deployment Projects	
INEEL/FEMP Integrated D&D	http://id.inel.gov/idd/
Fernald Personal Ice Cooling System	http://www.fernald.gov/CleanupSupport/Technology/deploy/pages/Page1.htm
Fernald Mobile Work Platform	http://www.fernald.gov/CleanupSupport/Technology/MWP.htm
LANL Decontamination and Volume Reduction System	http://www-emtd.lanl.gov/ASTD/DVRS.html
Rocky Flats Standard Waste Box Assay Counter	http://www-emtd.lanl.gov/RFETS/Crate.html
Rocky Flats Decommissioning In-Situ Plutonium Inventory Monitor	http://www.rfets.gov/ (click on Factsheets)
BNL MARSSIM	http://www.dne.bnl.gov/ewtc/bgposter.htm
Information on all EM ASTD Projects	http://id.inel.gov/astd/About.htm (click on Projects)

Industry Programs for Environmental Management – http://www.netl.doe.gov/products/em/pmem.html

The NETL Industry Programs supports the Environmental Management (EM) Office of Science and Technology (OST) by partnering with private sector companies to assist them in developing environmental technologies for application at DOE sites. In this process NETL works closely with all of the focus area technical managers and site personnel (including regulators and the public) to ensure that end user requirements are met. This partnering process and the phased nature of the contracts results in effective management of the projects; where projects are terminated or redirected as the technology matures and moves toward commercial application. Industry Programs has supported a total of 83 projects of which more than a third have been D&D related. Of the total 83 projects, 36 have been completed and 47 are ongoing. For the completed projects, 18 were terminated in the early stages of

development prior to more costly field testing, while 18 projects went through field demonstration. The private sector has been successful in deploying 12 of these 18 technologies that have gone through full-scale demonstration and project completion. A Technology Development Data Sheet (TDDS) is prepared for each project within the Industry Program. These TDDSs contain information on the need the technology is addressing, the solution and benefit that it provides, a description of the technology, project contacts, and if completed, a results section.

Gateway to Environmental Technologies (GET) – http://www.dandd.org/get/default.html

Through support from the NETL's University Programs, the Florida International University Hemispheric Center for Environmental Technology (FIU-HCET) provides DDFA with technology development and assessment assistance. Through the FIU-HCET Technology Assessment Program (TAP), D&D technologies are demonstrated and assessed in simulated conditions typically found at nuclear facilities.

In 1998, DDFA designated FIU-HCET as its central repository of D&D technology information. Since then, FIU-HCET's has developed a suite of integrated information systems, databases and decision-support tools that provide problem holders with up-to-date, reliable information, enabling them to find technological solutions to their project-specific problems. The Technology Information System (TIS) and LSDDP-TIS are similar interactive tools that provide project managers with general information about technologies for their remediation projects. Users can search on a specific technology name or enter broad technology specifications (e.g., concrete decontamination) to access information such as technology applications and capabilities, as well as vendor contact information. The LSDDP-TIS differs from the TIS in that the former contains information on only those technologies screened by the TSCs for demonstration at DDFA's LSDDPs, whereas TIS contains information from select DOE databases and other sources. Collectively, the TIS and LSDDP-TIS currently contain information on over 1400 technologies.

The Multimedia Information System (MIS), the Decision Support System (DSS), and the Dismantlement Information System (DIS) are three additional decision support systems available through the GET. The information in these systems is derived from actual assessments of technologies within the D&D TAP and through vendor communications. The system provides the user with detailed evaluations of different technology alternatives for surface decontamination (i.e., MIS and DSS) and for dismantlement options (i.e., DIS) based on user-defined parameters such as cost, performance, schedule, and health and safety requirements. The DSS also allows users to fine tune their selection by having the system perform multivariate "what-if" scenarios to arrive at solutions that best fit their needs. These decision support systems provide detailed technology assessment reports and multimedia photos and videos.

Office of Science and Technology – http://em-52.em.doe.gov/IFD/OSThome.htm

The OST homepage contains links to its technology development Focus Areas and Crosscut Programs, the Technology Management System (TMS), the Needs Management System (NMS), and electronic versions of the ITSRs.

The TMS includes information on all technology research, development and deployment efforts conducted by the Focus Areas and Crosscut Programs. Technology information in the TMS includes a technology identification number, technology description, technology maturity status, expected benefits, images, technology contacts, and technology demonstration and deployment data. The TMS is searchable using a keyword search or searching on a number of parameters, including the specific focus area or crosscutting program. Currently, there are 136 D&D technologies entered into the TMS. The TMS also provides a link to the NMS which contains summary data on all of DOE-EM's science and technology

needs and opportunities. Access to detailed science and technology need statements can be found on the individual homepages of the Site Technology Coordination Groups (STCGs), directly accessible via the OST homepage. ITSRs, containing cost and performance data on all D&D technologies demonstrated in LSDDPs, can be downloaded from a link through the OST homepage.

The National Decommissioning Program – http://www.em.doe.gov/dd/index.html

The National Decommissioning Program centers on identifying facility decommissioning issues and impediments to timely and cost-effective decommissioning, analyzing needed improvements, and delivering solutions applicable to decommissioning projects across the complex. By providing a national perspective on decommissioning progress and accomplishments, the National Decommissioning Program promotes safe, efficient, cost-effective decommissioning of DOE facilities. From the National Decommissioning Program's homepage, technology end users and D&D decision makers will find direct links to many useful documents to assist in the planning of D&D projects. Some of these documents are listed in the following paragraphs.

Decommissioning Benchmark Study – http://www.em.doe.gov/ftplink/dd/benchmrk.pdf

In January 1997, DOE's Office of Environmental Restoration (ER) and the U.S. Environmental Protection Agency conducted a benchmarking study of DOE's decommissioning program to analyze physical activities in facility decommissioning and to determine approaches to improve the decommissioning process. The study focused on quantifying productivity of decommissioning physical activities and identifying how productivity is affected by specific working conditions. The decommissioning benchmarking study was the foundation for two distinct products (http://www.em.doe.gov/define/): Environmental Restoration Requirements Definition and the Decommissioning Technologies Preferred Alternatives Matrix.

Environmental Restoration Requirements Definition Volume 1C: Decommissioning – ftp://www.em.doe.gov/www/define/decommis.pdf

The decommissioning requirements analysis focused on the 23 decommissioning problem sets, organized by media and contaminant. The problem sets were categorized as facility construction or residual waste. Within the facility construction category, problem sets were defined for decontamination, cutting/size reduction, and demolition of metals, concrete/masonry/brick, wood products, and asbestos. The residual waste problem sets included solids/debris, sludge, and liquids assumed to be secondary wastes currently in inventory from decommissioning facilities rather than in-place building materials.

The purpose of this report was to identify the decommissioning problem sets that comprise the ER program and to determine which problem sets could be readily satisfied by commercial practices. Thus, the report provided a basis for the DDFA to identify opportunities to apply commercially available technologies to DOE problems and to focus developmental activities on critical problem sets where no baseline or commercial technology existed.

Preferred Alternatives Matrices – http://www.em.doe.gov/define/d_pam.html

The Preferred Alternatives Matrices (PAMs) is a list of proven, commercially available decommissioning technologies presented in a hierarchy of the environmental conditions or problem sets defined in the Environmental Restoration Requirements Definition. The PAMs include approximately 150 technologies ranked on the basis of performance, risk of technology failure, and cost. The PAMs provide a tool for field personnel to focus remedy selection, expedite preferred alternatives implementation, eliminate the

cost of excessive/redundant treatability studies, and allow preselection of effective, low cost alternatives. The goal of the PAMs are to implement "the right technology, at the right time, at the right site."

Decommissioning Handbook – http://www.em.doe.gov/ftplink/dd/decomhandbk.pdf

The Decommissioning Handbook, recently revised to reflect DOE Order 430.1A *Life Cycle Asset Management (LCAM)*, is a technical guide for the decommissioning of nuclear facilities. The Decommissioning Handbook uses examples and information about lessons learned to illustrate established procedures and practices to implement the DOE decommissioning framework, as defined in DOE Guide 430.1-4 *Decommissioning Implementation Guide*. The handbook includes regulations governing decommissioning, worker and environmental protection, and packaging and transportation of waste materials. The handbook describes the overall decommissioning process and operating practices to assist in the preparation of the Decommissioning Plan and decommissioning operations.

Facility Deactivation Methods and Practices Handbook – http://www.em.doe.gov/facdeact/

The National Facility Deactivation Initiative has also recently revised the Facility Deactivation Method and Practices Handbook to reflect DOE Order 430.1A and the *Deactivation Implementation Guide* (DOE G 430.1-3). The Facility Deactivation Method and Practices Handbook addresses the management of physical assets from acquisition through operations and disposition, including stabilization of contaminated excess facilities. Whereas the Deactivation Implementation Guide provides high level guidance for implementing the deactivation requirements, the Handbook represents an in-depth level of information for implementing deactivation projects in accordance with LCAM requirements. The Handbook provides methods, examples, and lessons learned to assist with implementation of deactivation. The handbook focuses heavily on specifying completion (end-points) of deactivation as a key driver for project management and project engineering.

D&D Technology Module; Version 2.0 – http://nexi2.home.mindspring.com/page10.html

D&D Technology Module 2.0 was produced by FedTech and NES, Incorporated. It is a downloadable and searchable compendium of nuclear decontamination and decommissioning technology data. The Module currently contains six categories of D&D technologies; cutting tools, decontamination processes, dismantling techniques, safety equipment, robotics, and waste handling methods. The Module has captured U.S. and international experimental data, lessons learned, and an extensive library of technical descriptions for 746 specific tool models representing 485 technologies and 197 vendors. The D&D Technology Module may be queried to select only tools that meet the specific needs of a user and it contains active hyperlinks to the websites and e-mail addresses of technology vendors.

Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) –
http://www.epa.gov/radiation/marssim/filestoc.htm

A significant resource for characterization technologies is the MARSSIM. The MARSSIM provides a nationally consistent approach to conducting radiation surveys and investigations at potentially contaminated sites. Included in Appendix H of the MARSSIM is a comprehensive summary of field survey and laboratory equipment used to measure radiation levels and radioactive material concentrations.

Global Network of Environment & Technology, TechKnow 3.0 – http://www.gnet.org

TechKnow is an interactive database containing information on over 500 innovative remediation and environmentally sustainable technologies, including technologies specific to D&D applications. The database provides descriptions of the technologies, applicable remediation problem areas, and technology

cost data. In addition, vendor, patent, and licensing information is available. The advantage of the TechKnow database is that the majority of the technology data is made available by the technology vendor themselves. The TechKnow advanced "detailed" search engine, which allows one to conduct a multivariate search (media, contaminants, DOE problem area, vendor, etc), is a little confusing. In many cases, it may be preferable to use a simple keyword search such as "decontamination" or more specifically, "concrete decontamination."

Remedial Action Program Information Center (RAPIC) – http://www.em.doe.gov/rapic

The RAPIC supports the technical information needs of the ER Program in D&D of nuclear facilities and remediation of sites contaminated with hazardous and/or radioactive materials. RAPIC maintains a bibliographic database named Environmental Restoration Document Information System (ERDIS), which contains technical literature pertinent to the DOE ER Program. RAPIC can perform literature searches and provide copies of relevant technical documents.

TechCon – http://web.ead.anl.gov/techcon/

TechCon is an EM program based at Argonne National Laboratory. The TechCon team has developed a process that encourages and sponsors interaction among private and public sector organizations with common interests in environmental remediation. Interaction between environmental project teams, regulators and community stakeholders, technology developers and vendors, and experts from universities and government laboratories is the key to thorough review of alternative solutions and decisionmaking. TechCon brings the capabilities and project experience of these groups together to assess site-specific project operational constraints and cleanup criteria for environmental cleanup of soil, groundwater, facilities, and equipment.

Technology Information Exchange (TIE) – http://www2.em.doe.gov/tie

The TIE promotes sharing of expertise, experience, and lessons learned in environmental restoration and waste management among working level peers within DOE and other Federal and State agencies, private sector industries, and other interested stakeholders. This is accomplished through multiple forums including workshops, publications, and electronic media.

National Technology Transfer Center – Environmental – http://www.nttc.edu

The National Technology Transfer Center (NTTC), located at the Wheeling Jesuit University in Wheeling, West Virginia, provides services to assist entrepreneurs and companies seeking to access federally funded research and development (R&D) information. NTTC also provides assistance and services to help transfer technologies from the laboratory to U.S. business and industry for application. NTTC tracks, monitors, and maintains a database of federal R&D activities at more than 700 laboratories and 106 U.S. universities. NTTC provides technology information and links to technology providers for several technical areas including environmental (iridium.nttc.edu/environmental.html) and manufacturing technologies (iridium.nttc.edu/manufacturing.html).

The Nuclear Link – http://www.nuclearlink.com

The Nuclear Link was first presented on November the 5th, 1997, in La Coruña (Spain), at the 23rd Annual Meeting of the Spanish Nuclear Society. The Nuclear Link was developed by the Nuclear Division of Unión Fenosa, a Spanish electrical utility, and provides a useful tool for students, D&D professionals and companies of the nuclear industry. The website provides links to other web-based information resources group by topical areas in order to make searching easier. Some of the topical areas

include the following: governmental agencies and international organizations, electric utilities and nuclear power plants, radioactive waste, decommissioning, radiation protection, services and products, and nuclear data centers.

WasteLink – http://www.radwaste.org

The primary purpose of WasteLink is to provide a reference source for radioactive waste management professionals. The site strives to present unbiased information on this hotly debated and emotional issue; therefore, it provides links to many organizations and institutions on all sides of the issue–pro, anti, academic, government, and professional societies to name a few. This site provides resources and links to information related to radioactive waste characterization, handling, processing, storage, disposal, and transportation, as well as on decommissioning, mixed waste and health physics issues. Under "decommissioning" one can find general resources and links and specific decommissioning project information.

OTHER WEBSITES OF INTEREST

Table II provides the D&D professional with further information on D&D research, technologies, services, current events and lessons learned from completed D&D projects. Other sources of D&D technology information (Table III) are conferences, workshops and training courses. Proceedings and resource materials from these national and international venues include papers on D&D technologies, D&D operations, and lessons learned.

Table II. Other Websites of Interest to the D&D Professional

Website Name	Web Address
U.S. DOE Office of Environmental Management	http://www.em.doe.gov/
EM Web Search	http://search.em.doe.gov
U.S. DOE Directives Home Page	http://www.explorer.doe.gov:1776/htmls/directives.html
Links to DOE Site Decommissioning Projects	http://www.em.doe.gov/dd/decom_links.html
Deactivation Program	http://www.em.doe.gov/em60/deactivation.html
EM Office of Nuclear Material and Facility Stabilization	http://www.em.doe.gov/em60/
Small Business Innovation Research Program	http://sbir.er.doe.gov/sbir/
Small Business Technology Transfer Program	http://sttr.er.doe.gov/sttr/
Strategic Environmental R&D Program	http://www.serdp.org/
American Nuclear Society	http://www.ans.org/
American Society of Mechanical Engineers	http://www.asme.org/
National Organization of Test, Research, and Training Reactors	http://www.trtr.org
Nuclear Plant Journal	http://npj.goinfo.com/
U.S. Nuclear Regulatory Commission	http://www.nrc.gov/
International Atomic Energy Agency	http://www.iaea.org/worldatom/
Nuclear Energy Institute	http://www.nei.org/
OECD Nuclear Energy Agency	http://www.nea.fr/
Robotic Industries Association	http://www.robotics.org/

Table III. Conferences, Workshops and Training Courses

Single Conferences	Web Address
Waste Management	http://www.wmsym.org/
D&D Focus Area Mid-Year Review	http://www.netl.doe.gov/dd/
National Decommissioning Committee Meeting	http://www.em.doe.gov/dd/decom_schedules.html
TIE Workshop	http://www.em.doe.gov/tie/
International Conference on Nuclear Engineering	http://www.icone-conf.org/
TLG Services Decommissioning Conference	http://www.tlgservices.com/confrenc/confrenc.htm
Multiple Listings of Conferences, Workshops & Training Courses	**Web Address**
RAPIC Event Calendar	http://www.em.doe.gov/rapic/8event.html
American Nuclear Society Meetings	http://www.ans.org/meetings/
ASME International Calendar of Events	http://www.asme.org/calendar/
Robotic Industries Association Events	http://www.robotics.org/
Argonne National Lab Decommissioning Training Courses	http://pentium.ep.anl.gov/training/
Nevada Technical Associates, Inc.	http://www.ntanet.net/
NTTC Professional Development Workshops & Seminars	http://www.nttc.edu/flash/html_version/profess.asp

SUMMARY

This paper hopefully has provided the reader with many useful Internet resources and links to D&D technologies and related information. Many of the websites discussed can be directly accessed through the DDFA homepage. As more websites are identified which provide useful information relevant to the D&D operations and the DDFA, they will be linked to the DDFA homepage. Readers aware of websites not discussed in this paper are encouraged to contact the authors so that the website can be added to the DDFA homepage, if appropriate.